to: ISO/TC184/SC4/WG10   cc: ISO/TC184/SC4/WG2
cc: ISO/TC184/SC4/WG11   cc: ISO/TC184/SC4/WG3
cc: ISO/TC184/SC4/QC CMT   cc: ISO/TC184/SC4/JWG9
cc: ISO/TC184/SC4/PPC   cc: ISO/TC184/SC4/WG12

STEP/SC4 AP Framework Proposals and Related Recommendations

= Working Draft : V0.8A =

June 22, 1998

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Aero-Engine, Space and Gas Turbine
IHI

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Document History

(1) Proposal for STEP AP Architecture = Draft = ; V0.1, 1997.01.05 : WG10 N86?
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       WG10 N188,
       (Working Draft : post Bad Aibling Meeting)

Acknowledgments

Forewords

I Author.s Intention

The author is intending to contribute and encourage the integration efforts for preparing the second and future release of STEP/SC4 Standards.

II Author.s Expectation for Discussions

II.1 for Technical Architecture and Strategic Planing
(1) for WG10 :
 A Issue-1.2 : Development Methodology for AIRs and AICs(4.2)
 B Proposal-4 : Principles for AIRs and AIC Building Blocks (5.3)
 C Issue-2.3 : Missing Links and Insufficient GIRs, AIRs and AICs(7.3)
 D Recommendation-6 : Establish the Integration Mechanism (10)
(2) for WG11 :
 A Recommendation-6 : Establish the Integration Mechanism (10)
(3) for QC Change Management Team :
 A Proposal-5 : Criteria for classifying the APs, in and out scope of STEP/SC4 (6)
 B Recommendation-7 : Check List for PWI/NWI Proposal of AP Development (11)
(4) for PPC :
 A Proposal-1 : Integration Requirements for APs (3)
 B Issue-1.2 : Development Methodology for AIRs and AICs(4.2)
 C Issue-2.3 : Missing Links and Insufficient GIRs, AIRs and AICs(7.3)

II.2 for Standards Development Activities
(4) for WG2 :
 A Recommendation-1 : Recover the Missing Links for Mechanical Product (8.1)
 B Recommendation-6 : Establish the Integration Mechanism (10)
(5)   for WG3 and JWG9 :
 A Issue-1.1 : Flat structure of AP Framework(4.1)
 B Proposal-2 : Hierarchical AP Classification Structure (5.1)
 C Proposal-3 : Principles for APs and Conformance Classes (5.2)
 D Issue-2.1 : Insufficient Cross Industry Coordination and Integration Activities for
     Class-3 Group-3 Aps (7.1)
 E Issue-2.2 : Plural APs for one Product / Industry are covering the same area of
     . Product Structure & Configuration Item Control. (7.2)
 F Recommendation-4 : Develop the AIRs and AIC Building Block Library,
     and Integrate the Class-3 Layer-3 APs (9.1)
 G Recommendation-5 : Approach for Class-4 APs of covering Product Life Cycle (9.2)
 H Issue-3 : Issues for the Reorganization of the AP Structure (11)
(6) for Joint WG3/JWG9 and WG12 :
 A Issue-1.2 : Development Methodology for AIRs and AICs(4.2)
 B Proposal-4 : Principles for AIRs and AIC Building Blocks (5.3)
 C Issue-2.3 : Missing Links and Insufficient GIRs, AIRs and AICs(7.3)
 D Recommendation-4 : Develop the AIRs and AIC Building Block Library,
     and Integrate the Class-3 Layer-3 APs (9.1)
(7) for WG12 :
 A Issue-1.2 : Development Methodology for AIRs and AICs(4.2)
 B Proposal-4 : Principles for AIRs and AIC Building Blocks (5.3)
 C Issue-2.3 : Missing Links and Insufficient GIRs, AIRs and AICs(7.3)
 D Recommendation-1 : Recover the Missing Links for Mechanical Product (8.1)
 E Recommendation-2 : Recover the Missing Links supporting Functional Design of
     Assembly Products (8.2)
 F Recommendation-3 : Recover the Missing Links for Generative Draughting Capability (8.3)

Introductions

I The purpose of AP Framework is to provide following guidelines, [4]:
(1)   Classification Method and Structure for APs
(2)   Requirements for Integration and Interoperability of APs
(3)   Classification Method and Structure for AIRs and AIC Building Blocks
(4)   Criteria for prioritizing and coordinating the AP/AIC Development/Integration Projects
(5)   Check List for PWI/NWI Proposal of AP Development

II The proposals in this document are comprised as follows;
Category A : Requirements Definition
(1) Proposal-1 : Integration Requirements for APs (3)
Category B : AP Framework Principles
(2) Proposal-2 : Hierarchical AP Classification Structure (5.1)
(3) Proposal-3 : Principles for APs and Conformance Classes (5.2)
(4) Proposal-4 : Principles for AIRs and AIC Building Blocks (5.3)
Category C : Criteria for classifying the APs, in and out scope of STEP/SC4
(6) Proposal-5 : Criteria for classifying the APs, in and out scope of STEP/SC4 (6)

III The recommendations in this document are comprised as follows;
Category D : Recommendation-1 : Recover the . Missing Links. of GIRs, AIRs and AICs
(1) Recommendation-1 : Recover the Missing Links for Mechanical Products (8.1)
(2) Recommendation-2 : Recover the Missing Links supporting Functional Design of
        Assembly Products (8.2)
(3) Recommendation-3 : Recover the Missing Links for Generative Draughting Capability (8.3)
Category E : Strategy for the Methodology, Process and Approach for AP Developments
(4) Recommendation-4 : Develop the AIRs and AIC Building Block Library,
        and Integrate the Class-3 Layer-3 APs (9.1)
(5) Recommendation-5 : Approach for Class-4 APs of covering Product Life Cycle (9.2)
Category F : Establish the Integration Mechanism
(6) Recommendation-6 : Establish the Integration Mechanism (10)
Category G : Check List for PWI/NWI Proposal of AP Development
(7) Recommendation-7 : Check List for NWI Proposal of AP Development(11)

IV Issues for the Reorganization of the AP Structure are enumerated as follows;
(1) Issue-3.1 : APs for Machinery (11.1)
(2) Issue-3.2 : APs for Electric Systems and Electric Equipment & Electronic Devices (11.2)
(3) Issue-3.3 : APs for Automotive (11.3)
(4) Issue-3.4 : APs for Aircraft (11.4)
(5) Issue-3.5 : APs for Ships (11.5)
(6) Issue-3.6 : APs for Building and Construction (11.6)
(7) Issue-3.7 : APs for Process Plant (11.7)

V This proposal is prepared based on the following observations and analysis; such as,
(1)   Current status of STEP Standards Development (1)
(2)   Observation of the real World (2)
(3) Issue-1 : STEP/SC4 AP Framework related Current Management Issues : Group-1 (4)
(4)   Issue-2 : STEP/SC4 AP Framework related Current Management Issues : Group-2 (7)

VI This documents is

(1) succeeding the studies in early stage of STEP AP development and integration efforts performed in NIST, USA, in 1991, documented in Ref-4, and,

(2) enhancing the above studies, based on the observations of current status and trends of STEP/SC4, and preparation for the second and future STEP/SC4 Standards.

Table of Contents

1 Current Status of STEP/SC4 Standards Development --------. Where we are, now ?.

1.1 Initial Achievements of STEP Standards Development

First phase of STEP standard development have had finished and reached the following achievements of;

(1)   have established the first *set* of STEP Standards, comprised with several set of APs, AICs and IRs.

(2)   and, have established the Architecture and Methodology of Product Modeling for the foundation of consistent integration of STEP Standards Development.

(3)   beginning the enhancement and refinement of the first *set* of STEP Standards, coping with technical feedback from the Implementation Efforts in various STEP Validation Projects.

1.2 Industrial Requirements for STEP/SC4 Standards Development

Based on the initial achievements, *real* Industries are . encouraging. and/or . requesting. for the second phase STEP standard development activities, as follows ;

(1) Validate and/or Implement the AP Interoperability,

(2) Shorten the time-frame of Standard Development,

(3) Continuing the AP Development for Mechanical Products / Industry,

A: Manufacturing Technology for Mechanical Parts / Assembly

B: Engineering Analysis

(4) Broadening the Business Areas to apply the STEP Architecture;

i.e., Widening the STEP/SC4 APs;

A: APs covering the Product Life Cycle;

e.g., Part214: Automotive Design

B: APs for AEC Industry and Shipbuilding;

e.g., Building & Construction, Process Plant, and Shipbuilding

C: APs covering Operator.s Business Management;

e.g., Gas & Oil, Offshore

(5) Harmonizing and/or integrating with standards out of STEP, such as SGML;

e.g., Part232: TDP, according to the requirements of Product Data Management

(6)   Employing the New Information Technology

e.g., Object Oriented Modeling and Class Library Approach

1.3 Development for the second and future Release of STEP/SC4 Standards

Lot of international efforts has been jointly performed for developing the APs, based on above 1.2 Requirements.

Lot of APs have been already developed AAM and ARM, and are now reaching the final approach of the Interpretation and Qualification Process, for preparing and developing the second and future Release of STEP/SC4 Standards, comprising the following activities;

(1) Interpretation for AIM definition, using existing GIRs, AIRs and AICs.

(2) Integration for AIM definition, developing new GIRs, AIRs and AICs.

2 Observation of the Real World

2.1 Industry Structure : . **Hierarchical Supply Chain**.

Industries, in the real world, are structured in the . Hierarchical Supply Chain. , and each industrial firm and/or its business unit is living in this environment (Fig-2.1).

Social Infrastructures are identified at the top level on that chain, and Raw Material Process Industries are identified at the bottom level; in another words, they are identified as Downstream Industry back to Upstream Industry, correspondingly.

Over that scheme, Owner of Social Infrastructures, Process Plant and Building, and Transportation Business Firms are play the role of Operators. Such Owner Operators and End Users of Private Consumers are identified at the Summit Position over that chain.

2.2 Lifecycle Activities

Lifecycle Activities could be modeled into following decompositions (Fig-2.2).
(1) Lifecycle Configuration Management
(2) Design and Engineering
(3) Business Management

2.3 Industry vs. Business Function and/or Discipline

Industrial Firms are comprised with lot of Business Functions and/or Disciplines. They are identified in a Matrix of Industry vs. Business Function and/or Discipline (Table-2.3)

We can find almost all Business Functions and/or Discipline are working commonly in various industries. While, there are some specific and/or deeply specialized Business Functions and/or Disciplines are devoting to Product and/or Industry specific requirements.

Fig-2.1   Industry Structure
"Hierarchical Supply Chain"

Lifecycle Configuration Management

Change Management
Requirements Management
Product Structure & Configuration Item Control

Design & Engineering

Conceptual Design
Requirements
Definition

Performance &
Functional Design

Business Management

Production
Engineering

Production Control &
Procurements

Support
Engineering

Product Support Control
& Procurements

Recycle / Disposal
Engineering

Recycle / Disposal
Support

Engineering Analysis

Design & Engineering <Customer>

Business Management <Customer>

Operations Management
<Customer>

Recycle / Disposal
Management
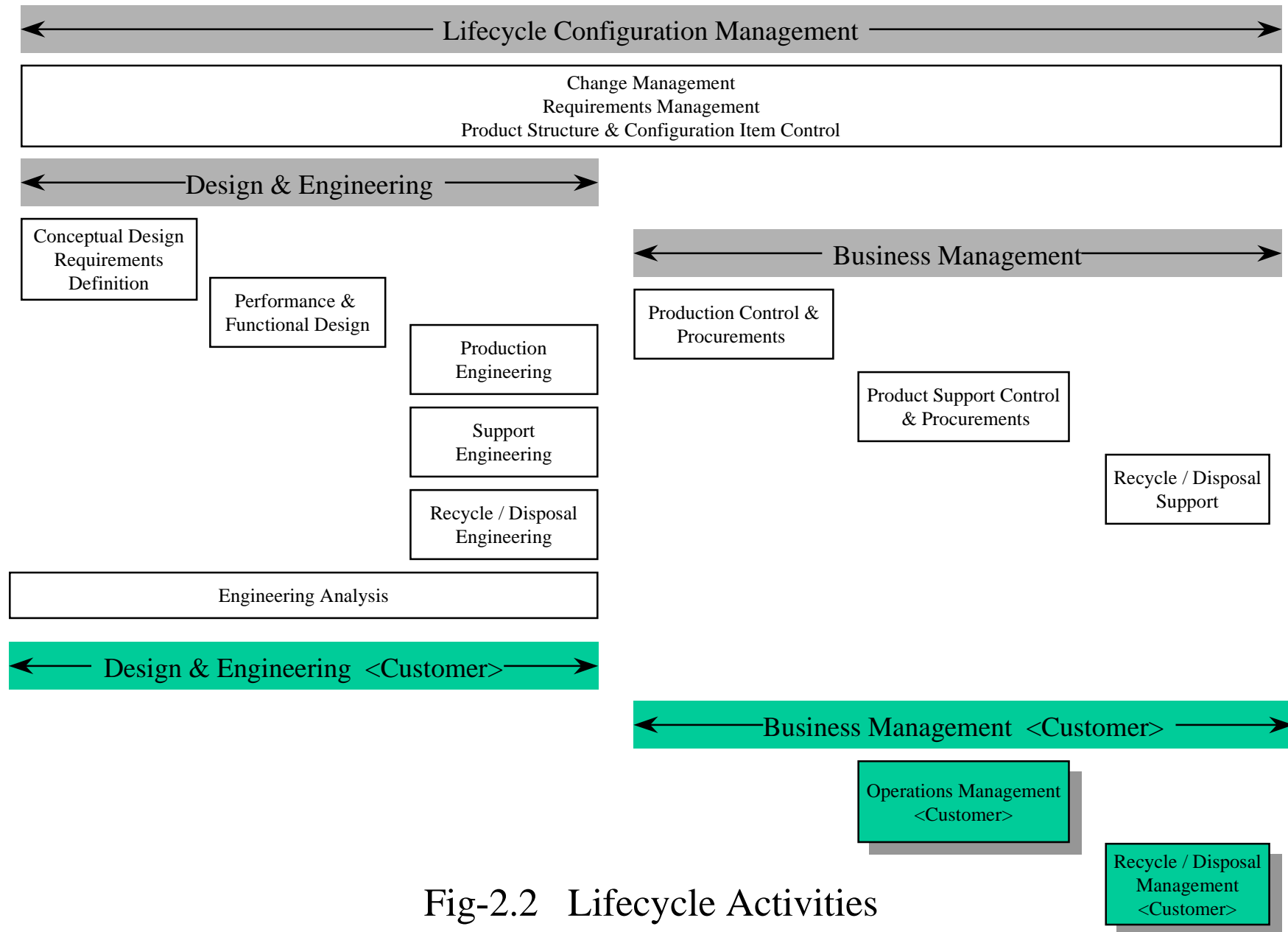<Customer>

Fig-2.2   Lifecycle Activities

Table-2.3 Industry vs. Business Function and/or Discipline

Business Function and/or Discipline	Common APs	Machinery	Electric / Electronic Devices	Electric Systems	Auto-mobile	Aircraft & Space Craft	Ship	Building & Construct-ion	Process Plant
Lifecycle Configuration Management									
Change Management	X	x	x	x	x	x	x	x	x
Requirements Management	X	x	x	x	x	x	x	x	x
Product Structure & Configuration Item Control	X	x	x	x	x	x	x	x	x
Design & Engineering									
Requirements Definition	X	x	x	x	x	x	x	x	x
Performance & Functional Design									
External Surface Design									
Fluid Dymanic Surface	X	x			x	x	x		
Arbitrary Free Form Surface	X	x	x	x	x	x	x		
Others	X	x	x	x	x			x	x
Spatial Arrangements	x			x	x	x	x	x	x
Functional System Schematic Design									
Process Plant System	x								X
HVAC System	x				x	x	x	X	x
Mechanical System	X				x	x	x	x	x
Electro-Technical System	x			X	x	x	x	x	x
Instrumentation & Control System	x	x	x	X	x	x	x	x	x
Equipment Specification Definition									
Machinery	X	x			x	x	x	x	x
Electro-Technical Equipment	x		x	X	x	x	x	x	x
Production Engineering									
Structure Design, Manufacturing & Construction									
External Surface Structure									
Mono-coque Structure	x				x	X			
Others	X	x	x	x	x	x	x	x	x
Inner Structure									
Plate / Shell Structure	x		x	x	x	x	X		
Frame / Beam Structure	x		x	x	x	x	x	X	x
Others	X	x		x	x	x			
Cable Suspension Structure	x			x				X	
Foundations Design & Construction	x			x	x	x	x	X	x
Outfitting Design, Manufacturing & Installation									
Piping & Tubing									
de-Cartesian Coordinate	x		x		x		x	x	X
Others	X	x			x	x			
Ducting (HVACS)	x				x	x	x	X	x
Cabling / Wiring									
Cable Rack & Cable Installatio	x			X			x	x	x
Wire Harness	x	x	X		x	x			
Mechanical Assembly / Parts Design & Manufacturing									
Mechanical Assembly / Parts									
Shape	X	x	x		x	x	x		
Design Form Feature	x	X	x		x	x	x		
Tolerances	x	X	x		x	x			
Mechanical Product Definition for Process Planning	x	X			x	x	x		
NC Process Planning & NC Data Preparation	x	X			x	x	x		
Design & Mfg. for Cast Parts	x	X			x	x	x		
Design & Mfg. for Forged Parts	x	X			x	x	x		
Sheet Metals Manufacturing	x	x	x		x	X	x		
Welding	x	x	x		x	x	x		
Electro-Mechanical Assembly			X						
Printed Circuit Assembly (incl. MCM)			X						
Support Engineering						X			
Recycle / Disposal Engineering					X				
Engineering Analysis									
Heat & Mass Balance	x							x	x
Computational Fluid Dynamics	x	x			X	X	X		
Structure Analysis	X	x	x	x	x	x	x	x	x
Thermal Analysis	X	x	x		x	x			
Kinematics	X	x	x		x	x	x		
State Transition Analysis			X	x	x	x	x		x
Logic Analysis			X		x	x			
Naval Architects							X		
PLIB, MLIB Access									
PLIB Access	PLIB	=	=	=	=	=	=	=	=
MLIB Access	MLIB	=	=	=	=	=	=	=	=
Product Data Library & Documentation									
Product Data Library	X	=	=	=	=	=	=	=	=
Documentation	SGML	=	=	=	=	=	=	=	=
Draughting	X	=	=	=	=	=	=	=	=
Business Management									
Production Control									
Material Requirement Planning	X	x	x	x	x	x			
Production / Procurements Order Release	X	x	x	x	x	x	x	x	x
Parts Manufacturing Shop Control	X	x	x		x	x			
Assembly Shop Control	X	x	x	x	x	x	x	x	x
Site Construction / Commissioning	X			x				x	x
Operations Control									
Product Support Management									
Recycle / Disposal Management									

Legend :   x : Cross Point,   X : Candidate Representative Industry for specific Business Function / Disipline,   = : ditto
PLIB : Parts Library,   MLIB : Material Library,   MCM : Muliti-Chip Module,   SGML : SGML Family of Standards

3 Proposal-1 : Integration Requirements for APs

3.1 Proposal-1.1 : Data Reusability Requirements

Principal Integration Requirements is to support .Data Reusability. between both end of data exchange / data sharing partners, based on .equality. or .equal partnership. principle.

Definition of Data Reusability:
The Creator of the specific data,
  can define and/or instanciate the data contents
    as an output of their activities,
    using the terminology of their business function or discipline,
      or industry sector specific terms,
  and can transfer the data to and/or can share with its user.
The User of the specific data,
  can utilize the instanciated contents of the transferred / shared data
    for performing their activities,
  can define and/or add their own data as a creator,
  and can feed back their comments and/or change request
    to the original creator of the data.

3.1.0 Fundamental Assumption

Fundamental assumptions underlying to define the AP Integration Requirements are as follows;
(1) each company, each functional division is utilizing specific application system and/or CAx system, according to .their own choice., with .their own risks..
(2) coordination and/or negotiation to be made for selecting the applying STEP/SC4 APs and their Conformance Classes, between both end of data exchange / data sharing, based on .equal partnership. principle.

3.1.1 .Data Reusability Requirements-#1.
.Data Reusability. between .Higher. and .Lower. Industrial Firm on Hierarchical Customer-Supplier Chain

The first Integration Requirement is to support .equality. of both end of .Higher. and .Lower. Industrial firm, on the hierarchical customer-supplier chain;
(1) A .Higher. Industrial firm can acquire the product item and its data, according to their own industrial data standard, from several .lower. industry firms.
(2) A .Lower. industrial firm can supply the product item and its data, according to their own industrial data standard, to various .higher. industry firms.

3.1.2 .Data Reusability Requirements-#2. ; .Data Reusability. through .predecessor. and .successor. on Lifecycle Stage of Product

3.1.3 .Data Reusability Requirements-#3. ; .Data Reusability. between different Discipline

3.1.4 .Data Reusability Requirements-#4. ; keeping .Commonality. of specific Discipline, working in different industries

The forth Integration Requirements is to keep .commonality. of specific discipline, working in multiple industries.
This requirement is the foundation of realizing;

(1) the Data Reusability Requirements-#1.
(2)   AP Interoperability Requirements of 1.2(1) in accordance with Proposal-1.2,
(3)   Shorten the time-frame of Standards Developments, 1.2(2).

3.2 Proposal-1.2 : AP Interoperability Requirements

  . AP Interoperability. is the essential integration requirements to support and for realizing the
 . Proposal-1.1 : Data Reusability Requirements. .

Requirement Definition of AP Interoperability:
  Data, common for multiple APs, should be defined and instantiated
as a single and unique data in the shared database and / or data transfer file

---

4 Issue-1 : STEP/SC4 AP Framework related Current Management Issues : Group-1

Corresponding to the very limited scope of initial release, and first stage of standard development efforts are concentrated onto that limited scope, current STEP/SC4 AP Framework gives the difficulties for to realizing current Industrial Requirements, because of its following limitations;

4.1 Issue-1.1 : Flat structure of AP Framework

Current APs are structured in no class, no layer, no group, in contrast to Integrated Resources of part 40s, and 100s.

This current , Structure, gives no guideline for classifying and positioning the APs, in case of evaluating the PWI/NWI proposal.

4.2 Issue-1.2 : Development Methodology for AIRs and AICs

A AIRs, whose design principle has changed in some late stage of initial release development, their ENTITIES are strictly allowed only after UoF overlapping between two or more APs is confirmed in qualification process.

B AIC, which is designed, at the very late stage of initial release development, for keeping the interoperability between plural APs, development is strictly restricted only after UoF overlapping between two or more APs is found and confirmed in interpretation and qualification process.

This methodology is one of the fundamental cause of requesting the long term for AP development, because of its , after discovery, approach   instead of , strategic invention, approach.

5 Principles of AP Framework

5.1 Proposal-2 : Hierarchical AP Classification Structure
STEP/SC4 APs are to be hierarchically structured into three level classification of
．Class．Layer．Group．．(Fig-5.1)

5.1.0 Three Level Classification Structure
Classification of ．Class．Layer．Group．are to be defined by following category:
(1) Class : classified by the nature of covering range of the AP
(2) Layer : classified by target Industry / Business function / Discipline of the AP,
        under specific Class
(3) Group : classified by the commonality of the scope, under specific Layer

5.1.1 Class
．Class．is to be classified into following four category:
(1) Class-1 : APs common for Business Function and/or Discipline
(2) Class-2 : APs for PLIB, MLIB Access
(3) Class-3 : APs specific for each Business Function and/or Discipline
(4) Class-4 : APs covering Product Lifecycle, including multy Business Function / Discipline

5.1.2 Layer
Layer is to be classified into following seven category, under specific Class:
A under Class-1 : APs common for Business Function and/or Discipline
(1) Layer-1 : Product Data Library and Documentation APs
B under Class-2 : APs for PLIB, MLIB Access
(2) Layer-2 : APs for accessing to the Parts Library, Material Library
C under Class-3 : APs specific for each Business Function and/or Discipline
(3) Layer-3 : APs for Business Function / Discipline
(4) Layer-4 : Product / Industry Specific Business Function / Discipline APs
**D under Class-4 : APs covering Product Lifecycle, including multi Business Function
        / Discipline**
(5) Layer-5 : Product Life Cycle APs for Component Products
(6) Layer-6 : Product Life Cycle APs for Assembly Products
(7) Layer-7 : Product Life Cycle APs for Operators

5.1.3 Group
Group is to be classified by the commonality of the scope, under a specific Layer

Class-4 : APs covering Product Lifecycle,
including multi Business Function / Discipline

Layer-7: Product Lifecycle APs for Operators
Group-3: Plant Owners:

Group-2: Transportation

Group-1: Social Infrastructures:

Layer-6: Product Lifecycle APs for Assembly Products
Group-3: Shipbuilding and AEC:

Group-2: Vehicles and Crafts Mfg.:

Group-1: Electric System

Layer-5: Product Lifecycle APs for Component Products

Class-3 : APs specific for each Business Function /Discipline

Layer-4: Product / Industry Specific APs
Group-3: Spatial Arrangement, Function & Performance

Group-2: Structure Design, Manufacturing & Construction

Group-1: External Surface Design

Layer-3: APs for Business Function / Disciplinary
Group-7: Engineering Analysis

Group-6: Electric / Electronic Devices Design & Manufacturing

Group-5: Mechanical Assembly / Parts Design & Manufacturing

Group-4 Outfitting Design, Fabrication & Installation

Group-3: Functional System Schematic Design

Group-2: Production Control

Group-1: Lifecycle Configuration Management

Class-2 : PLIB, MLIB

Layer-2: APs for Parts, Raw Materials

Class-1 : APs common for Business Function / Discipline

Layer-1: Product Data Library and Documentation APs
Group-2: Documentation

Group-1: Product Data Library APs

AICs : Application Interpreted Constructs

AIRs : Application Integratred Resources
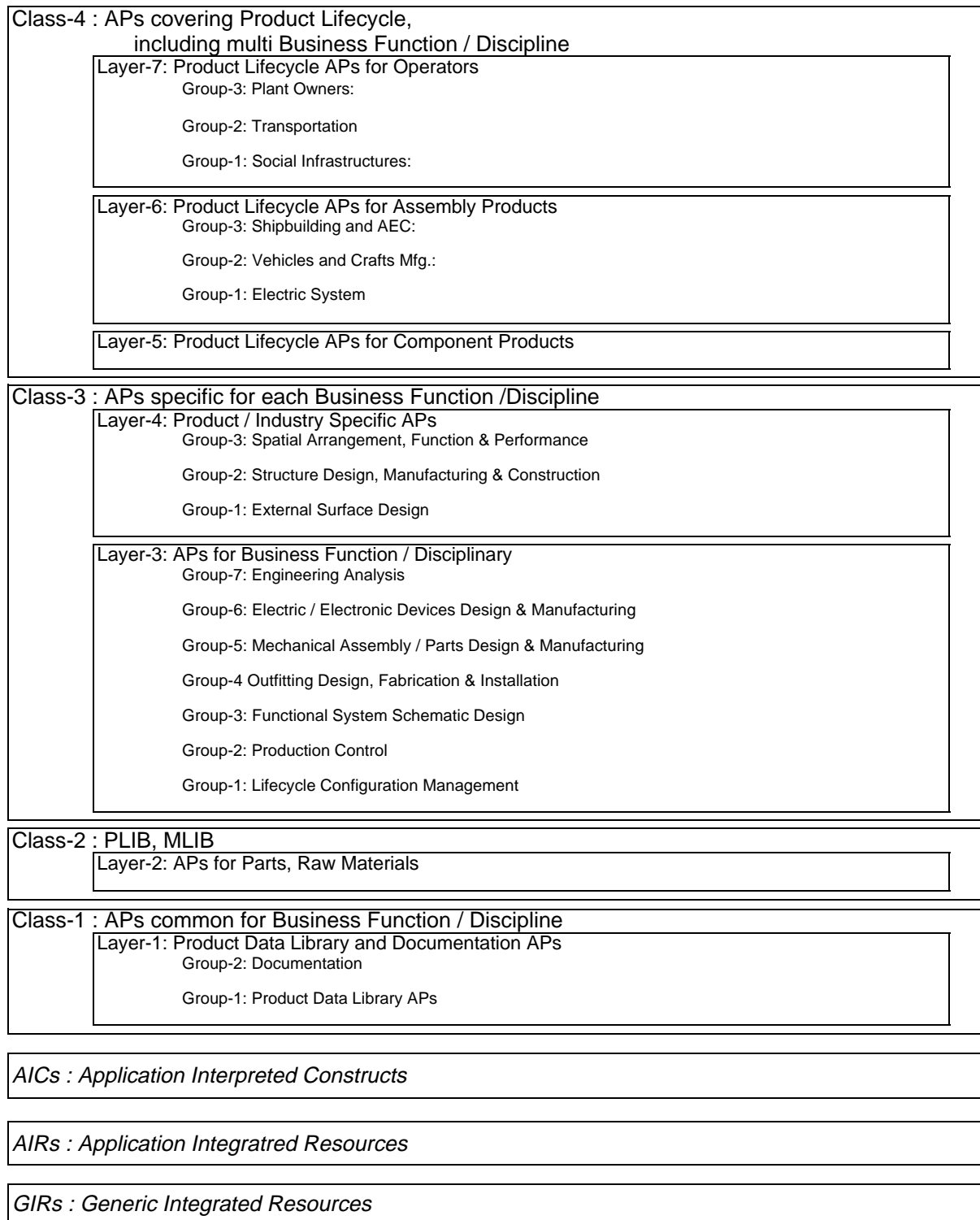
GIRs : Generic Integrated Resources

Fig-5.1 Hierarchical AP Classification Structure

5.2 Proposal-3 : Principles for APs and Conformance Classes

5.2.0 Fundamental Principles for APs
APs are to be segmented and structured principally depending on the following scope definition;
(1) Scope Definition
  A Single AP for a specific scope.
  B A specific scope, if it is common for multiple industry, is to be formed into single AP
    through cross industry coordination and integration activities.
(2) Terminology
  A in case of above (1)B, Common Terminology, are to be initiated by representing industry,
  B but, the industry specific terminology can be used by each industry.

5.2.1 Principles for . Data Reusability Requirements-#1.
    . Data Reusability. between . Higher. and . Lower. Industrial Firm
    on Hierarchical Customer-Supplier Chain
    (corresponding to Requirement 3.1.1)
(1) Correspond to Business Function and/or Discipline:
    Data Exchange and/or Data Sharing to be performed between corresponding Business
    Function and/or Discipline working in both end of . Higher. and . Lower. Industrial firm.
(2) Scope Definition and Conformance Class:
  Same scope definition for each one of the conformance class of . Higher. level AP and
  . Lower. level AP
(3) Terminology:
  . lower. level industry initiate . common. terminology based on their world,
  but each . higher. industry can use their own terminology, corresponding to
  the . common. terminology defined by . lower. level industry.

5.2.2 Principles for . Data Reusability Requirements-#2. ;
    . Data Reusability. through . predecessor. and . successor.
    on Lifecycle Stage (corresponding to Requirement 3.1.2)
(1) Define the Interface Data:
  Define the interface data to be transferred / shared, in one of the part of UoF, at least in the AP
  of successor, who is to play the role of requester for data transfer / data sharing.
(2) Scope Definition and Conformance Class:
  Same scope definition for interface data in each one of the conformance class of . predecessor.
  AP and . successor. AP.

5.2.3 Principles for . Data Reusability Requirements-#3. ;
    . Data Reusability. between different Discipline
    (corresponding to Requirement 3.1.3)
(1) Define the Interface Data:
  Define the interface data to be transferred / shared, in one of the part of UoF, at least in the
  APs of receiver / requester.
(2) Scope Definition and Conformance Class:
  Same scope definition for interface data in each one of the conformance class of APs at both
  end.

5.2.4 Principles for . Data Reusability Requirements-#4. ;
    keeping . Commonality. of specific Discipline, working in different
    industries (corresponding to Requirement 3.1.4)
(1) keeping the correspondence of each Business Function and/or Discipline working in different
  industries
(2) Scope Definition and Conformance Class:
    Same scope definition for each one of the conformance class of each relevant AP in different

    industries

(3) Terminology:

    representing industry initiate . common. terminology based on their world,
    but each industry can use their own terminology, corresponding to the . common. terminology
    defined by representing industry.

5.3 Proposal-4 : Principles for AIRs and AIC Building Blocks

AIR and/or AIC is designed and established for assuring and keeping the consistency and integrity of Product Data Modeling in STEP/SC4, for realizing ﹒3.2 Proposal-1.2 : AP Interoperability Requirwements﹒﹒

5.3.1 Proposal-4.1 : Principles for AIRs

Part100 series AIRs are foundation for establishing the APs of STEP, in conjunction with Part40 series GIRs, via AICs.

(1)   AIRs are to be organized corresponding to each Business Function and/or Discipline.
(2)   AIRs are to be segmented into the modules, so that they can be integrated ﹒plug and play﹒ coupling, and can be assembled in a hierarchical manner.
(3) Scope Definition
　A Single AIR for a specific scope, common for multiple industry
(4) Terminology
　A Common Terminology, initiated/established by representing industry,
　B but, the industry specific terminology can be used, in each industrial AP.

5.3.2 Proposal-4.2 : Principles for AIC Building Blocks

AIC is an atomic module of AIM, covering the atomic unit of a ﹒UoF﹒﹒ AIC, therefore, is the ﹒key stone﹒, which play the role of ﹒Building Block﹒ of STEP/SC4 Standards.

(1)   AICs are to be organized corresponding to each Business Function and/or Discipline.
(2)   AICs are to be segmented into the modules, so that they can be integrated ﹒plug and play﹒ coupling, and can be assembled in a hierarchical manner.
(3) Scope Definition
　A Single AIC for a specific scope, common for multiple industry
(4) Terminology
　A Common Terminology, initiated/established by representing industry,
　B but, the industry specific terminology can be used, in each industrial AP.

6 Proposal-5 : Criteria for classifying the APs, in and out scope of STEP/SC4

6.1 Criteria out Scope of SC4
(1) Standards not relating Product Model and/or Production Control, Operations Control
(2) Data Contents of Parts Library, Material Library and/or Class Library for AP Class-2, Layer-2
      (could be managed by registration agency, or leave it as de fact standards, or library contents
      business)
(3) Standards relating Product Model and/or Production Control, but not using STEP Architecture,
      and are required to be integrated with SC4 for cooperative use of such standards.
(4) Product Model and/or Production Control, not using STEP Technology

6.2 Criteria out Scope of STEP but in Scope of SC4

6.2.1 Scope Definition
(1) APs for Business Management instead of Product Model, such as Production Control &
      Procurements in Discrete Manufacturing Industry and / or Operations Control in Process
      Industry, AP Class-3, Layer-3, Group-2

6.2.2 Product Model using STEP Technology but dose not fully depending on STEP Architecture
(1) APs covering Product Life Cycle, but not conforming with Requirement defined in 5.2.1
      Some APs of AP Class-4, Layer-6, Layer-7

6.3 Criteria in Scope of STEP
(1) Product Model using STEP Architecture
  A Class-1 Layer-1
  B Class-2 Layer-2
  C Class-3 Layer-3, except Group-2
  D Class-3 Layer-4

  Layer-1, Layer-2, and Layer-3 except Group-2 are kernel set of STEP, and they can not be allowed
to be not conforming with STEP Architecture.

7 Issue-2 : STEP/SC4 AP Framework related current Management Issues : Group-2

Current status of APs under development could be analyzed and illustrated in . Current STEP/SC4 AP Matrix. of Table-7 and . STEP/SC4 AP Classification. of Fig-7

7.0 Observation : Multiple type of AP Structure / Organization

(1)   There are three types of AP Structure and/or Organization for a Product / Industry;

   Type-A Aircraft and / or Mechanical Product :
       APs created corresponding to Business Function and/or Discipline
       APs prepared piece-by-piece approach

   Type-B Electric / Electronic System :
       Disciplinary Oriented APs,
       same APs supporting and/or covering every Industry

   Type-C Automotive :
       Single AP, covering some phases of life cycle,
       which covers every area of business function and/or discipline,
       except Electric / Electronics

(2) We can find multiple type of APs;

   Type-A Class-3 APs for specific area of Business Function / Discipline

   Type-B Class-4 Layer-5 containing AP functionalities of Class-3, Class-1
       e.g. : AP214

   Type-C APs dealing with too small scope, and suggested to be AICs ?
       e.g. : AP204, AP205

7.1 Issue-2.1 : Insufficient Cross Industry Coordination and Integration Activities for Class-3 Group-3 APs

Cross industry coordination and integration activities are not performed yet, in accordance with the requirement level of Proposal-3 : Principles for APs and Conformance Classes.

Such cross industry coordination and integration activities are to be expected at least following areas;

(1)   Mechanical Product Definition and Production Engineering for Mechanical Product
    Manufacturing;
   between Aircraft and Machinery Manufacturing, and Automobile Manufacturing sector.

(2) Functional Design of Assembly Products;
   between Shipbuilding, Process Plant and Building and Construction.

(3) Mechanical Product Definition;
   between Machinery Manufacturing of Component Supplier and
   Shipbuilding, Process Plant and Building & Construction sector.
   between Machinery Manufacturing of Component Supplier and
   Automobile Manufacturing sector.

(4) Structure Design, Fabrication and Construction;
   between Shipbuilding, Process Plant and Building and Construction.

(5) Piping Layout, Fabrication and Construction;
   between Shipbuilding, Process Plant and Building and Construction

7.2 Issue2.2 : Plural APs for one Product / Industry are covering the same area of . Product Structure & Configuration Item Control.

e.g., APs for Process Plant, 221, 227 and 231
     APs for Shipbuilding, AP215-218, and AP226

7.3 Issue-2.3 : Missing Links and Insufficient GIRs, AIRs and AICs

GIRs, AIRs and AICs are insufficient, despite lot of AP development activities are being performed, corresponding to issue-2.1 : insufficient cross industry coordination and integration activities..

We can find several Missing Links for following areas;

(1) Mechanical Product
   A Shape related Missing Links
   B Parametric related Missing Links
   C Feature related Missing Links
(2) Functional Design of Assembly Products
   D Schematics related Missing Links
   E Arrangements Design related Missing Links
(3) Generative Draughting
   F Generative Draughting related Missing Links

Table-7 Current STEP/SC4 AP Matrix

Business Function and/or Discipline	Industry Sector and/or Product								
	Component Mfg.			Assembly Industry / System Engineering					
					Vehicle & Craft			AEC	
	Common APs	Machinery	Electric / Electronic Devices	Electric Systems	Auto-mobile	Aircraft & Space Craft	Ship	Building & Construct-ion	Process Plant
Lificycle Configuration Management									
Change Management	208	208	x	212	x	208	215-218,226	x	221,227,231
Requirements Management	X	x	x	x	x	x	x	x	x
Product Structure & Configuration Item Control	203-1	203-1	212,210,220	212	214-8,9,10	203-1	215-218,226	230	'221,227,231
Design & Engineering									
Requirements Definition	X	x	x	x	x	x	x	x	x
Performance & Functional Design									
External Surface Design									
Fluid Dymanic Surface	203-n	203-n			214-n	203-n	216		
Arbitrary Free Form Surface	203-n	203-n	203-n	203-n	214-n	203-n	216		
Others	203-n	203-n	203-n	203-n	214-n		216	225	203-n
Spatial Arrangements	203-n			203-n	214-n	x	215	225	227
Functional System Schematic Design									
Process Plant System	x			203-n					221,231
HVAC System	x			203-n	x	x		228	221,227
Mechanical System	X				x	x	217,226	x	221,227,231
Electro-Technical System	212			212	212	212	212	212	212,221
Instrumentation & Control System	212	212	212	212	212	212	212	212	212,221,231
Equipment Specification Definition									
Machinery	X	x			x	x	x	x	x
Electro-Technical Equipment	x		x	X	x	x	x	x	x
Production Engineering									
Structure Design, Manufacturing & Construction									
External Surface Structure									
Mono-coque Structure	203-n				214-n	203-n,222			
Others	203-n	203-n	203-n	203-n	214-n	203-n	218	x	x
Inner Structure									
Plate / Shell Structure	203-n		203-n	203-n	214-n	203-n	218		
Frame / Beam Structure	203-n		203-n	203-n	214-n	203-n	218	230	230
Others	203-n	203-n		203-n	214-n	203-n			
Cable Suspension Structure	x			203-n				X	
Foundations Design & Construction	x			x	x	x	x	X	x
Outfitting Design, Manufacturing & Installation									
Piping & Tubing									
de-Cartesian Coordinate	x		x		214-n		217	x	227
Others	X	x			214-n	x			
Ducting (HVACS)	x				x	x	x	X	x
Cabling / Wiring									
Cable Rack & Cable Installation	212			212			212	212	212
Wire Harness	212	212	212		212	212			
Mechanical Assembly / Parts Design & Manufacturing									
Mechanical Assembly / Parts									
Shape	203-n	203-n	203-n		214-n	203-n	218		
Design Form Feature	x	X	x		214-n	x	218		
Tolerances	219	219	x		214-n	219			
Mechanical Product Definition for Process Planning	224	224			214-n	224	x		
NC Process Planning & NC Data Preparation	213	213			214-n	213	x		
Design & Mfg. for Cast Parts	223	223			214-n	223	x		
Design & Mfg. for Forged Parts	229	229			214-n	229	x		
Sheet Metals Manufacturing	x	x	x		x	207	x		
Welding	x	x	x		214-n	x	218		
Electro-Mechanical Assembly	210,212		210,212						
Printed Circuit Assembly (incl. MCM)	210,220		210,220						
Support Engineering						X			
Recycle / Disposal Engineering					X				
Engineering Analysis									
Heat & Mass Balance	x						x		231
Computational Fluid Dynamics	x	x			X	X	X		
Structure Analysis	209	209	x	x	x	209	x	230	230
Thermal Analysis	X	x	x		x	x			
Kinematics	X	x	x		214-16	x	x		
State Transition Analysis			X	x	x	x	x		x
Logic Analysis			X		x	x			
Naval Architects							215,216		
PLIB, MLIB Access									
PLIB Access	PLIB	=	=	=	=	=	=	=	=
MLIB Access	MLIB	=	=	=	=	=	=	=	=
Product Data Library & Documentation									
Product Data Library	232	=	=	=	=	=	=	=	=
Documentation	SGML	=	=	=	=	=	=	=	=
Draughting	201,202	=	=	=	=	=	=	=	=
Business Management									
Production Control									
Material Requirement Planning	X	x	x	x	x	x			
Production / Procurements Order Release	X	x	x	x	x	x	x	x	x
Parts Manufacturing Shop Control	X	x	x		x	x			
Assembly Shop Control	X	x	x	x	x	x	x	x	x
Site Construction / Commissioning	X			x				x	x
Operations Control									
Product Support Management									
Recycle / Disposal Management									

Legend :   # : Part #,   203-n : Part203 - Conformance Class n,   214-n* : not including Mfg.,   x / X : Potential AP,   = : ditto
PLIB : Parts Library,   MLIB : Material Library,   MCM : Muliti-Chip Module,   SGML : SGML Family of Standards

Class-4 : APs covering Product Lifecycle,
including multi Business Function / Discipline

Layer-7: Product Lifecycle APs for Operators
Group-3: Plant Owners:
e.g.; *Process Plant, Oil & Gas Offshore*
Group-2: Transportation
e.g.; *Maritimes, Land Transportation, Railways, Air Lines*
Group-1: Social Infrastructures:
e.g.; *Transportation Networks / Facilities*
Fresh Water Supply System / Sewerage System, Gas Supply Networks
Power Supply Networks / Communication Networks

Layer-6: Product Lifecycle APs for Assembly Products
Group-3: Shipbuilding and AEC:
e.g.; *Shipbuilding, Building & Construction, Process Plant*
Group-2: Vehicles and Crafts Mfg.:
e.g.; **214**:*Automobile, Aircraft / Spacecraft Mfg.*
Group-1: Electric System :**212**:

Layer-5: Product Lifecycle APs for Component Products
e.g.; *Machinery, Electric Equipment, Electronic Devices*

Class-3 : APs specific for each Business Function /Discipline

Layer-4: Product / Industry Specific APs
Group-3: Spatial Arrangement, Function & Performance
e. g.; , , , **215**:*Ship's Arrangement*, **215,216**:*Naval Architects,*
225:*Building & Construction,* **227,231**:*Proess Plant*
Group-2: Structure Design, Manufacturing & Construction
e.g.; *External Surface Structure, Inner Structure for*
214-n:*Automobile,* **203-n,222**:*Aircraft / Spacecraft ,* **218**:*Ship*
Group-1: External Surface Design
e.g.; *External Surface Design for* **214-?**: *Automobile,* **203-n**:*Aircraft / Spacecraft,*
216:*Ship,* **225**:*Building & Construction*

Layer-3: APs for Business Function / Disciplinary
Group-7: Engineering Analysis
e.g.; **231**:*Heat & Mass Balance Calculation, Computational Fluid Dynamics,*
209,230:*Structure Analysis, Thermal Analysis, Kinematics,*
State Transition Dynamics, Logic Analysis
Group-6: Electric / Electronic Devices Design & Manufacturing
e.g.; **210,212**:*Electro-Mechanical Assembly ,* **210,220**:*Printed Circuit Assy*
Group-5: Mechanical Assembly / Parts Design & Manufacturing
e.g.; **203-n,204,205**:*Product Shape ,* **2xx**:*Design Form Features ,* **219**:*Tolerances,*
224:*Mechanical Product Definition for Process Planning using Form Features*
213:*NC Process Planning & Numerical Control Data Preparation,*
223:*Design & Mfg. for Cast Parts,* **229**:*Design & Mfg. for Forged Parts,*
207:*Sheet Metals Manufacturing ,* **218**:*Welding*
Group-4 Outfitting Design, Fabrication & Installation
e.g.; **217,227**:*Piping / Tubing & Ducting ,* **228,221,227**:*HVAC System ,*
212:*Cable / Wire Harness*
Group-3: Functional System Schematic Design
e.g.; **221,231**:*Process Plant System ,* **217,226,221,227,231**:*Mechanical System ,*
212:*Electro-Technical System*
Group-2: Production Control
e. g.; *Material Requirement Planning,*
Production Order Release, Procurement Order Release,
Parts Manufacturing Shop Control, Assembly Shop Control,
Site Construction / Commissioning Management
Group-1: Lifecycle Configuration Management
e.g.; **208**:*Lifecycle Change Management,*
203-1:*Product Structure & Configuration Item Control*

Class-2 : PLIB, MLIB

Layer-2: APs for Parts, Raw Materials
e.g.; *Standard Parts, Pipe, Structure Materials, Sheet Metals*

Class-1 : APs common for Business Function / Discipline

Layer-1: Product Data Library and Documentation APs
Group-2: Documentation
e.g.; **201,202**:*Draughting,* **SGML**
Group-1: Product Data Library APs
e.g.; **232**:*TDP*

Fig-7 STEP/SC4 AP Classification

8 Recover the Missing Links of GIRs, AIRs and AICs

8.1 Recommendation-1 :
Recover the Missing Links for Mechanical Product
. Dependencies of IRs for Mechanical Product Definition. could be illustrated in Fig-8.1.

8.1.1 Recommendation-1.1 :
Recover the Shape related Missing Links
(1)   The mechanism for allowing "mixed use of multiple type shape model in single part shape" definition to be defined in GIR, instead of to be defined in requesting APs
(2)   Single and consistent "Shape Representation Interface" to be defined in GIR, as a target of;
 A constraint definition in Explicit Parametrics mechanism
  B Tolerancing
  C Form Feature definition

8.1.2 Recommendation-1.2 :
Recover the Parametrics related Missing Links
   Explicit Parametrics supporting 2D and 3D are to be developed as one of the top priority missing links, supporting :
  A Symbol Mechanism for Draughting
  B Sub-model Mechanism for Arrangement Design
   C instanciation Mechanism for PLIB, MLIB

8.1.3 Recommendation-1.3 :
Recover the Feature related Missing Links for Mechanical Product Definition
  In the area of Mechanical Product Definition, Feature related capability are to be developed as one of the top priority missing links , such as :
(1) APs and/or AIRs: Features
    A Design Form Features or Shape Representation Interface
    B Tolerances related to Design Form Features / Shape Representation Interface
   C Machining Features related to Design Form Features
(2) Generic Integrated Resource: Featuring Definition Mechanism
  A feature definition
  B relation definition
  C parameter definition

8.2 Recommendation-2 :
Recover the Missing Links supporting Functional Design of Assembly Products
  Dependencies of IRs for Schematic Design and Arrangements Design in Functional Design of Assembly Products could be illustrated in Fig-8.2.1 and Fig-8.2.2.

8.2.1 Recommendation-2.1 :
Recover the Schematics related Missing Links
  In the area of Assembly Products, Functional Schematic Design capability, in piping / tubing design, electric wiring design, are to be developed as one of the top priority missing links (Fig-8.2.1), such as :
(1) APs and/or AIRs: Functional Schematics
  A Process Flow Diagram
  B P&ID : Piping and Instrumentation Diagram

   C Wiring Diagram
    D Logic Diagram
(2) Generic Integrated Resource: Schematics Definition Mechanism
   A function definition
   B relation definition
   C parameter definition

8.2.2 Recommendation-2.2 :
Recover the Arrangements Design related Missing Links

  In the area of Assembly Products of Process Plant, Building and Construction and Ships, Arrangements Design capability, of Plot Plan and Pipe Rack Layout, Piping Layout are common design function and it is to be developed as one of the top priority missing links (Fig-8.2.2).

8.3 Recommendation-3 :
Recover the Missing Links for Generative Draughting Capability

  . Generative Draughting. capabilities are requested for supporting following area;
(1)   Mechanical Parts and Assembly Drawing (Fig-8.1)
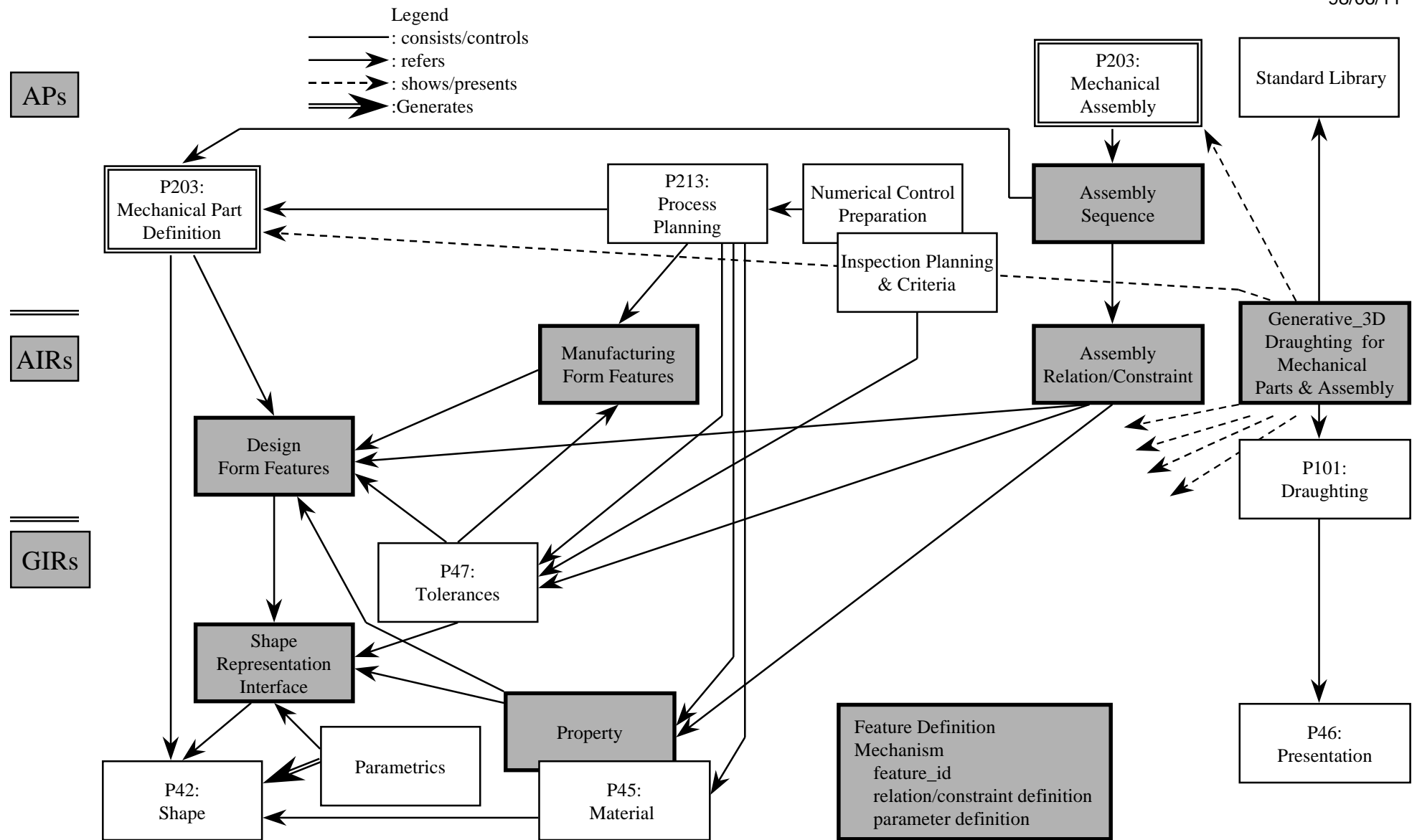(2)   Schematic Diagrams(Fig-8.2.1)
(3)   Arrangement Drawings(Fig-8.2.2)

Fig-8.1   Dependencies of IRs for Mechanical Products
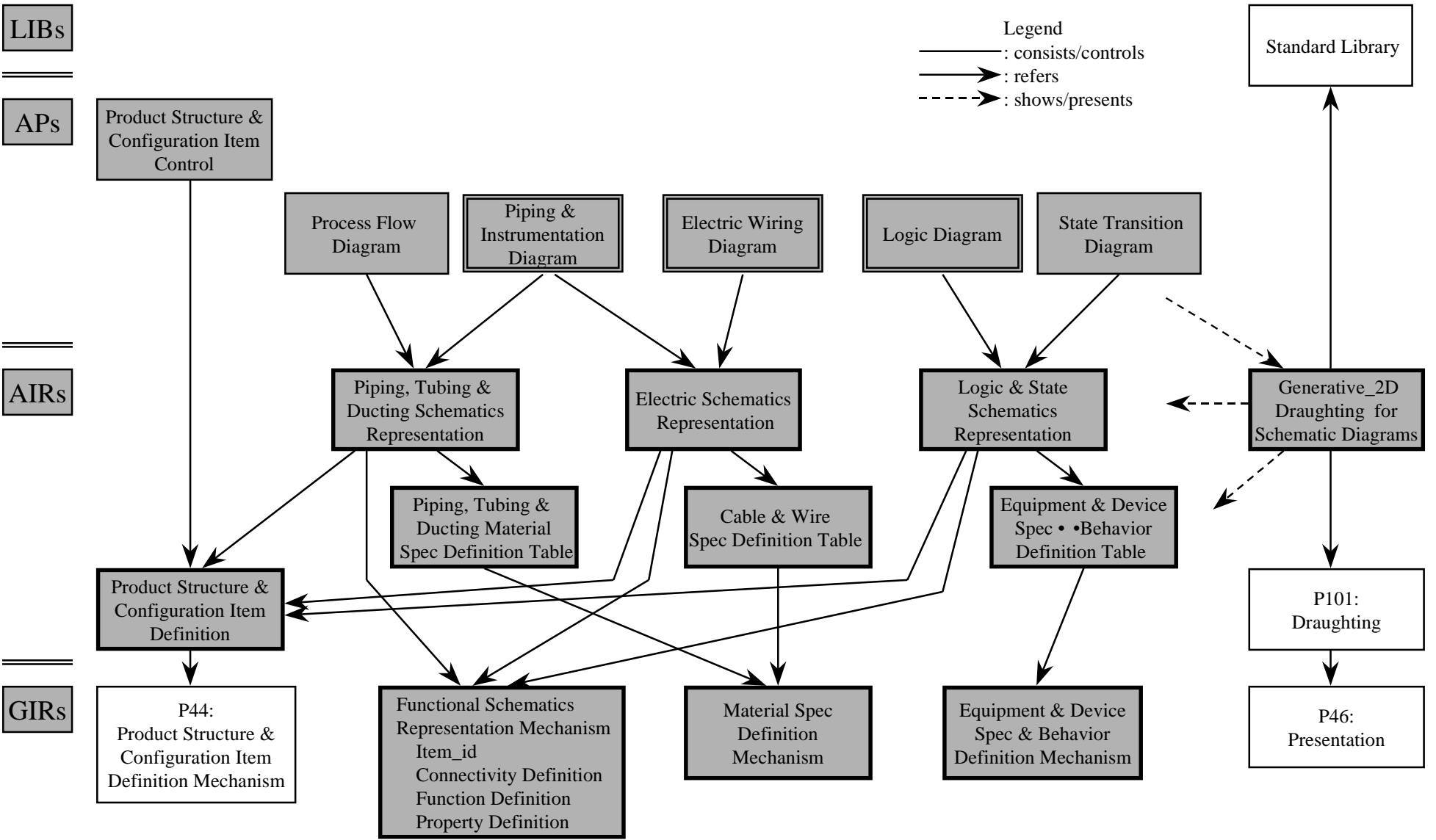
Fig-8.2.1   Dependencies of IRs for Schematic Model & Diagram

LIBs

APs

AIRs

GIRs

Legend
: consists/controls
: refers
: shows/presents

Standard Library

Product Structure & Configuration Item Control

Piping & Instrumentation Diagram

Piping Layout Drawing

Plot Plan & Passage Layout

Piping, Tubing & Ducting Schematics Representation

Piping Layout

Equipment Shape & Nozzles

Equipments Arrangement

Generative_3D Draughting for Arrangement Dwgs

Piping, Material Spec

Pipe Racks Skelton

Pipe Passage Layout

Product Structure & Configuration Item Definition

Structures & Foundations

P101: Draughting

Shape Representation Interface

P44: Product Structure & Configuration Item Definition Mechanism

Material Spec Definition Mechanism

P42: Shape

P46: Presentation

Fig-8.2.2   Dependencies of IRs for Arrangement Design

9 Improve the Methodology, Process and Approach for AP Developments

. Methodology, Process and Approach. is to be reviewed and revised for assuring AP Interoperability and speed up the Standard Development activity.

9.1 Recommendation-4 : Develop the AIRs and AIC Building Block Library, and Integrate the Class-3 Layer-3 APs

9.1.1 Recommendation-4.1 : Enrich the AIRs and AIC Building Block Library

It is recommended to establish the common understandings that . enrich the AIRs and AIC Building Block Library. , assuring AP Interoperability and speed up the Standard Development activity.

(1)   to allow and encourage the simultaneous development of APs or even an AP, and AIRs and AIC Building Blocks.

Need to deregulate the current constraints of . Issue-1.2 : Development Methodology for AIRs and AICs. (4.2).

(2)   STEP/SC4 standard development activities are, now, to be driven to concentrate to enrich the AIRs and AIC Building Block Library

9.1.2 Recommendation-4.2 : Encourage the Cross Industry Coordination and Integration Activities for specific Business Function of Class-3 Layer-3 APs

It is vitally important for STEP Standards Development to establishing the common understanding that the Class-3 Layer-3 APs are the . kernel APs of STEP. .

Key management issue for realizing . 9.1.1 Enrich the AIRs and AIC Building Block Library. , is to take following approach:

(1)   Organize the . Joint Working Group. and/or Select the . representing industry. for specific Business Function and/or Discipline of Class-3 Layer-3 APs

e.g., Schematic Design; out of piping design, electric wiring design, logic design, corresponding to 8.2.1, Recommendation-2.1

Arrangements Design; out of plant engineering, building & construction, and ship. corresponding to 8.2.2, Recommendation-2.2

(2) the . Joint Working Group. and/or Representative Industry for specific AP,

A develop the common AAM and ARM,

B develop an AIR and AICs, simultaneously with their AIM,

preparing common basis for relevant industry and/or product, based on their own requirements identified in their AAM and ARM.

9.2 Recommendation-5 : Approach for Class-4 APs of covering Product Lifecycle

9.2.1 Recommendation-5.1 : Each Industry is recommended to setup a top level APs of Class-4 Layer-5, 6, 7, covering Product Lifecycle for its industry and /or product.

(1) Top level APs of Class-4 Layer-5, 6, 7

A define the life cycle AAM,

B define the ARM, necessary for supporting above AAM

C and calling and/or referring, by means of . schema collection. of lower level APs and AICs, including;

Class-3 Layer-3 APs, and
their industry/product specific Class-3 Layer-4 APs, developed by themselves.
  D It is not allowed Class-4 APs directly define the data model, which are to be defined in
    APs of Class-3, Class-2, and Class-1
    E First group of conformance classes has to define the life cycle change management and
      product structure and configuration item control

9.2.2 Recommendation-5.2 :
Each Industry has to develop a single Integrated AP for . Product Structure & Configuration Item Control. , covering whole product life cycle;
to be called by above 9.2.1(1)E.

9.2.3 Recommendation-5.3 :
Each Industry is recommended to develop their industry/product specific Class-3 Layer-4 APs;
to be called by above 9.2.1(1)C.

10 Recommendation-6 : Establish the Integration Mechanism

10.1 Reccomendation-6.1 :
Establish the . Schema Collection. Mechanism

. Schema Collection. Mechanism is a common foundation for ;
(1)   solving following requirements of;:
   A 5.3.1 (2) AIRs are to be segmented into the modules, so that they can be integrated
        . plug and play. coupling, and can be assembled in a hierarchical manner.
   B 5.3.2 (2) AICs are to be segmented into the modules, so that they can be integrated
        . plug and play. coupling, and can be assembled in a hierarchical manner.
(2) realizing :
  A 9.2.1 (1) Top level APs of Class-4 Layer-5, 6, 7
        C calling and/or referring, by means of . schema collection. of lower level APs
       and AICs, including;
         Class-3 Layer-3 APs, and
         their industry/product specific Class-3 Layer-4 APs, developed by
         themselves.

10.1 Reccomendation-6.2 :
Establish the . External Reference. Mechanism

. External Reference. Mechanism is a common foundation for ;
(1) realizing :
  A 8.1.1 Parametrics
  B 8.3 Generative Draughting Capability
(2)   establishing :
  C Parts Library

11 Issues-3 : Issues for the Reorganization of the AP Structure

11.1 Issue-3.1 : APs for Machinery

(0)   APs for Machinery could be illustrated in Fig-10.1, following the manner of APs for Ships of Fig-10.5, relating to Fig-8.1.

It is recommended that :

(1) Separation of AP203 into;

  A Product Structure and Configuration Item Control

  B Product Shape Definition

  following to the statement of ⹁9.2.2⹁ of Recommendation-5.2.

(2) Integration of Mechanical Product Definition, to support the activities following 8.1.3 :
Recommendation-1.3.

  A Product Shape Definition out of AP203

  B Design Form Features Definition

  C Tolerances Definition

(3)   AP204, AP205 are to be deleted from AP world, because they have been included in AP203 of relevant Conformance Class, and are covering same scope as AICs,

  referring ⹁7.2 Issue2.2 : Type-B⹁.

11.2 Issue-3.2 : APs for Electric Systems and Electric Equipment & Electronic Devices

It is recommended that :

(0) Relationships and organization of APs for Electric Systems are to be illustrated following the manner of APs for Ships / Process Plant.

  A It wiil be helpfull for harmonization with APs for design, procurements and installation activities in the other assembly products.

(1) Integrate the Functional Design Models following :

  A 8.2 Reccomendation-2

  B 9.1 Recommendation-4

(2)   APs for Electric Equipment & Electronic Devices following the manner of APs for Machnery

  It is to be related to Fig-8.1, to support the activities following 8.1.3 : Recommendation-1.3.

11.3 Issue-3.3 : APs for Automobil

It is recommended that APs for Automotive Industry should be reorganized in accordance with following guidelines;

(0) Separate and/or split AP214 into several APs, at least following three Groups;

  A Class-4 layer-6 Group-2: Product Life cycle APs for Assembly Products,

        as for the ⹁new⹁ AP214

  B Class-3 Layer-4, Product / Industry Specific APs

        as for Automotive /.Automotive Industry Specific APs

  C Class-3 Layer-3, APs specific for each Business Function and/or Discipline

        as for common APs for Machinery /.Mechanical Industries

(1) Class-4 layer-6 Group-2: Product Life cycle APs for Assembly Products,

        as for ⹁new⹁ AP214,

  following to the statement of ⹁9.2.1 (1) C & D⹁ of Recommendation-5.1;

(2) Class-3 Layer-3 Group-1: Life cycle Configuration Management

  Single Integrated AP for ⹁Product Structure & Configuration Item Control⹁ for an Industry, covering whole product life cycle,

  following to the statement of ⹁9.2.2⹁ of Recommendation-5.2;

(3) Class-3 Layer-4, Product / Industry Specific APs

as for Automotive /.Automotive Industry Specific APs

(4) Class-3 Layer-3 Group-5: Mechanical Assembly / Parts Design and Manufacturing
Product

It will be highly appreciated that if those APs, which are studied in process of current AP214 development, are separated and integrated into a set of APs common for Mechanical Assembly / Parts Design and Manufacturing Product, harmonizing with those activities following . 11.1 Isses-3.1 (1), (2). .

11.4 Issue-3.4 : APs for Aircrafts

(0) APs for Aircraft could be illustrated Fig-10.4, following the manner of APs for Ships of Fig-10.5, relating to APs for Machinery of Fig-10.1.

  A It is to be related to Fig-8.1, to support the activities following 8.1.3 : Recommendation-1.3,

  B It will be helpful for the activities following 9.2.1 : Recommendation-5.1,

  C and also be helpfull for understanding the initial idea of product lifecycle integration for assembly products.

11.5 Issue-3.5 : APs for Ships

(0) APs for Ships are organized and designed in accordance with their guideline of . Building Block. Approach, could be illustrated in Fig-10.5.

  It is recommended that :

(1) Consolidate to an Integrated AP for . Product Structure & Configuration Item Control. for Process Plant, covering whole product life cycle

 following to the statement of . 9.2.2. of Recommendation-5.2;

  A Pick up the . Product Structure & Configuration Item Control. data model out of current APs of AP215-218, and AP226 and consolidate them into single Integrated AP. following to the statement of . 9.2.2. of Recommendation-5.2;

  B Limit the scope of AP215-218 and AP226 into their named specific definition.

(2) Integrate the Functional Design Models following :

  A 8.2 Reccomendation-2

  B 9.1 Recommendation-4

11.6 Issue-3.6 : APs for Building and Construction

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11.7 Issue-3.7 : APs for Process Plants

(0) APs for Process Plant could be illustrated Fig-10.7, following the manner of APs for Ships of Fig-10.5.

 It is recommended that APs for Process Plant Industry should be reorganized according to the following guideline;

(1) Consolidate to an Integrated AP for . Product Structure & Configuration Item Control. for Process Plant, covering whole product life cycle

 following to the statement of . 9.2.2. of Recommendation-5.2;

  A Pick up the . Product Structure & Configuration Item Control. data model out of current AP221, AP227 and AP231 and consolidate them into single Integrated AP.

  B Limit the scope of AP221, AP227 and AP231 into their named specific definition.

(2) Integrate the Functional Design Models following :
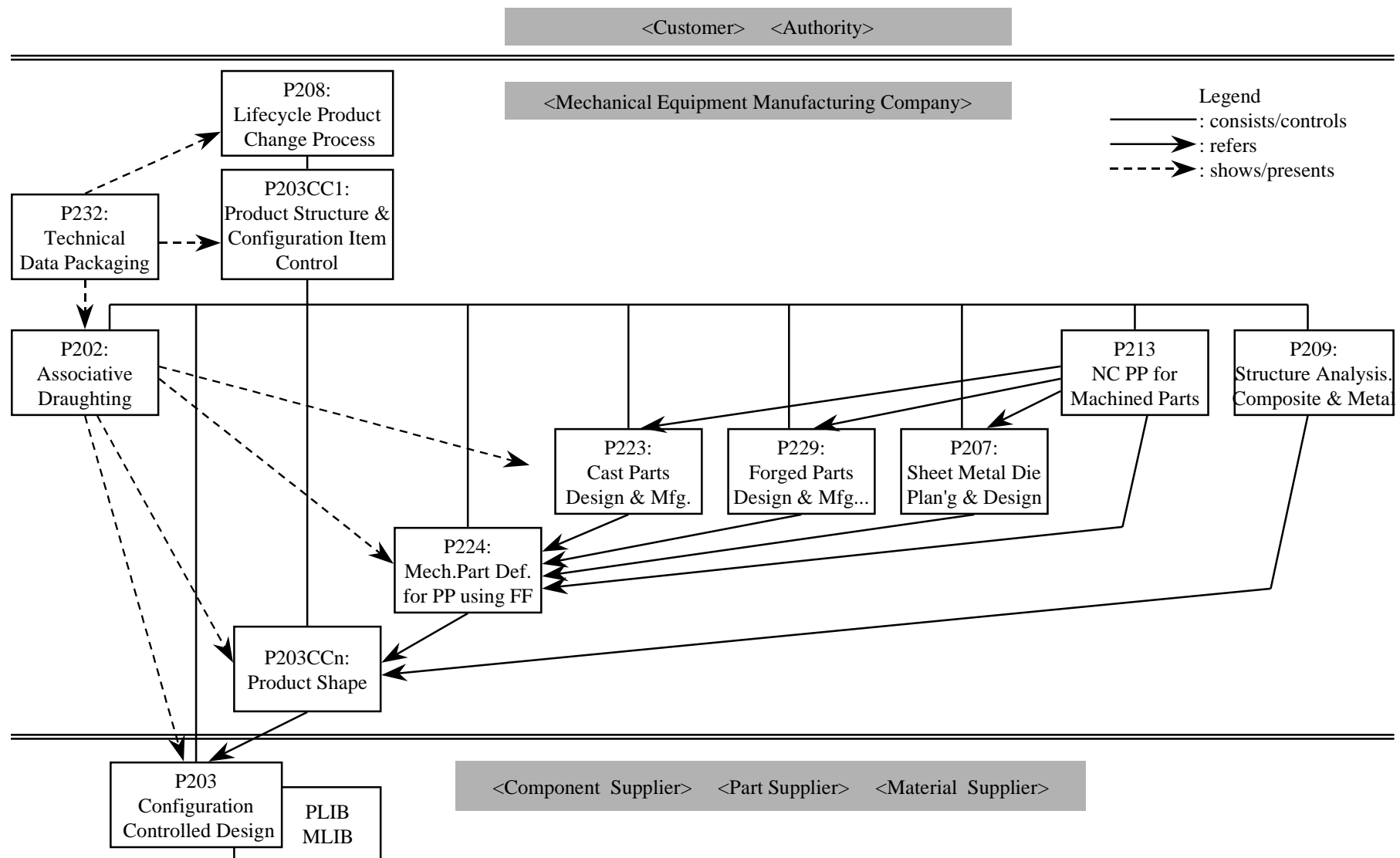
  A 8.2 Reccomendation-2

  B 9.1 Recommendation-4

Fig-11.1 Dependencies of APs for Mechanical Products

<Air Liners>   <Authority>

<Aircraft Company>

Legend
: consists/controls
: refers
: shows/presents

P208:
Lifecycle Product
Change Process

P2203CC1
Product Structure &
Configuration Item
Control

P232:
Technical
Data Packaging

P202:
Associative
Draughting

P203:
Mechanical
Systems

P203:
Accommodation

P212:
Electrical
Design & Instl'n

Tubing
(HVACs)

P203:
Structures

P203:
Arrangements
(Aircraft Architects)

P203:
Master
Dimensions

<Part Supplier>   <Material Supplier>

<Component Supplier>

PLIB
MLIB

P203
Configuration
Controlled Design

P212
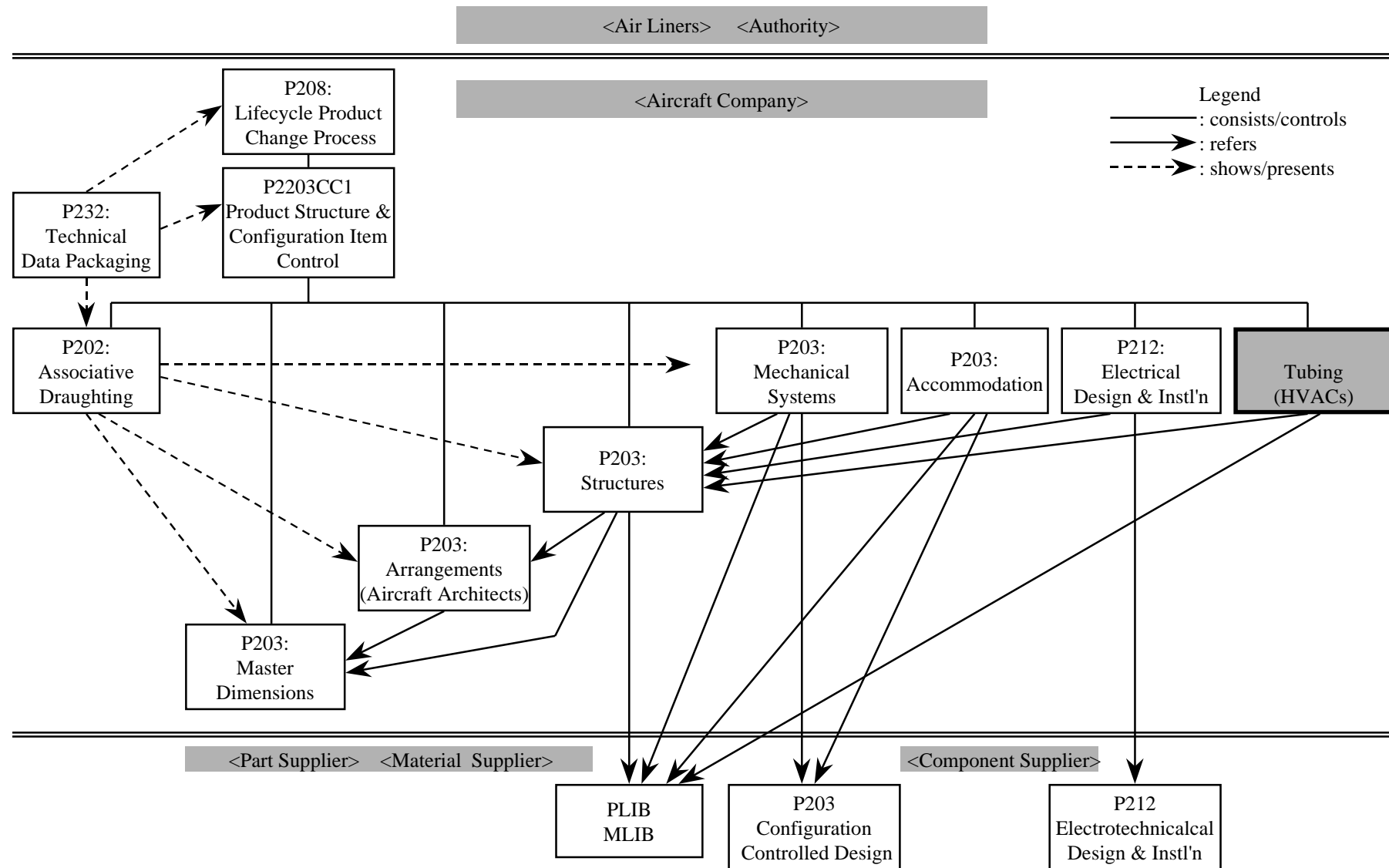Electrotechnicalcal
Design & Instl'n
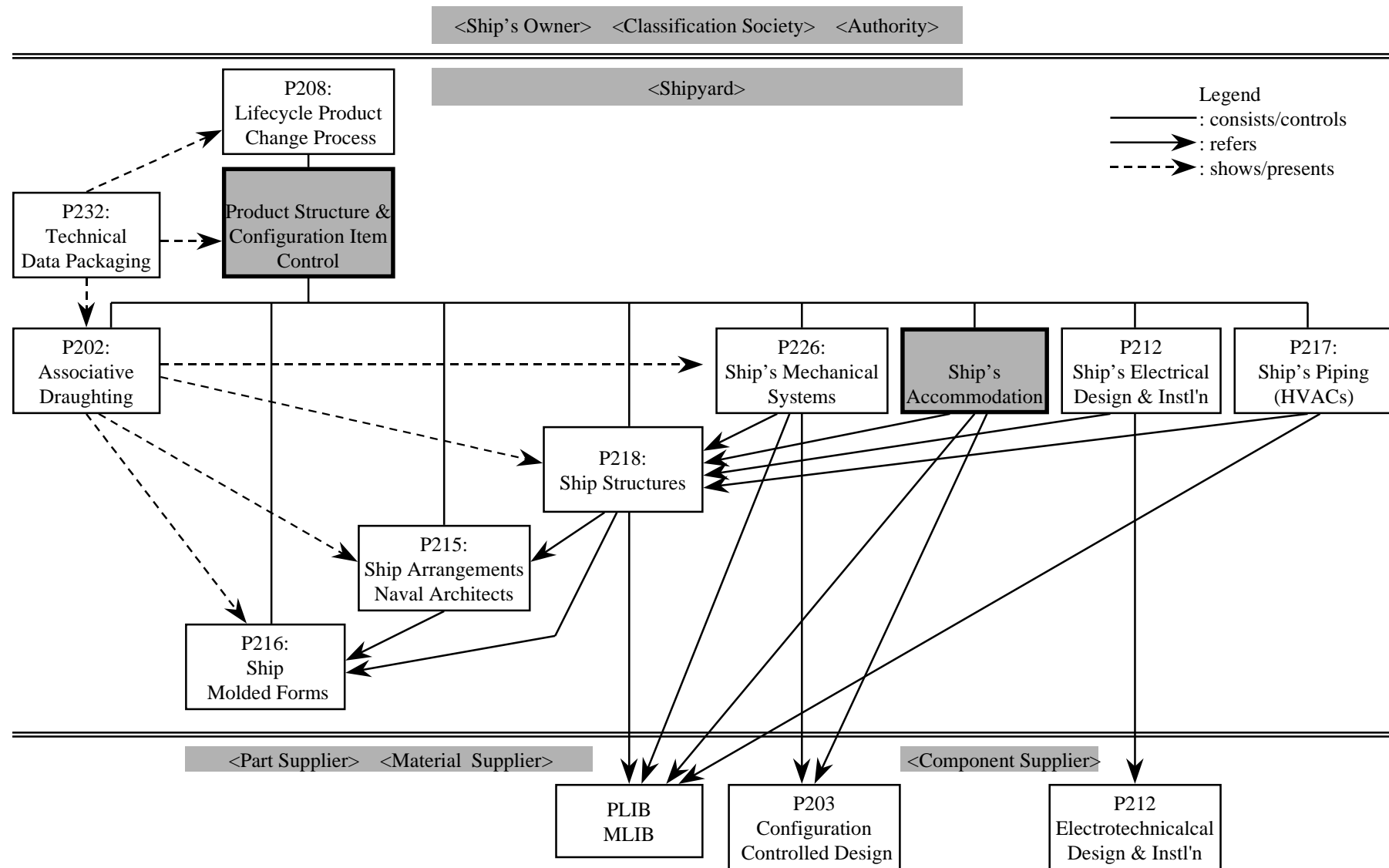
Fig-11.4 Dependencies of APs for Aircrafts
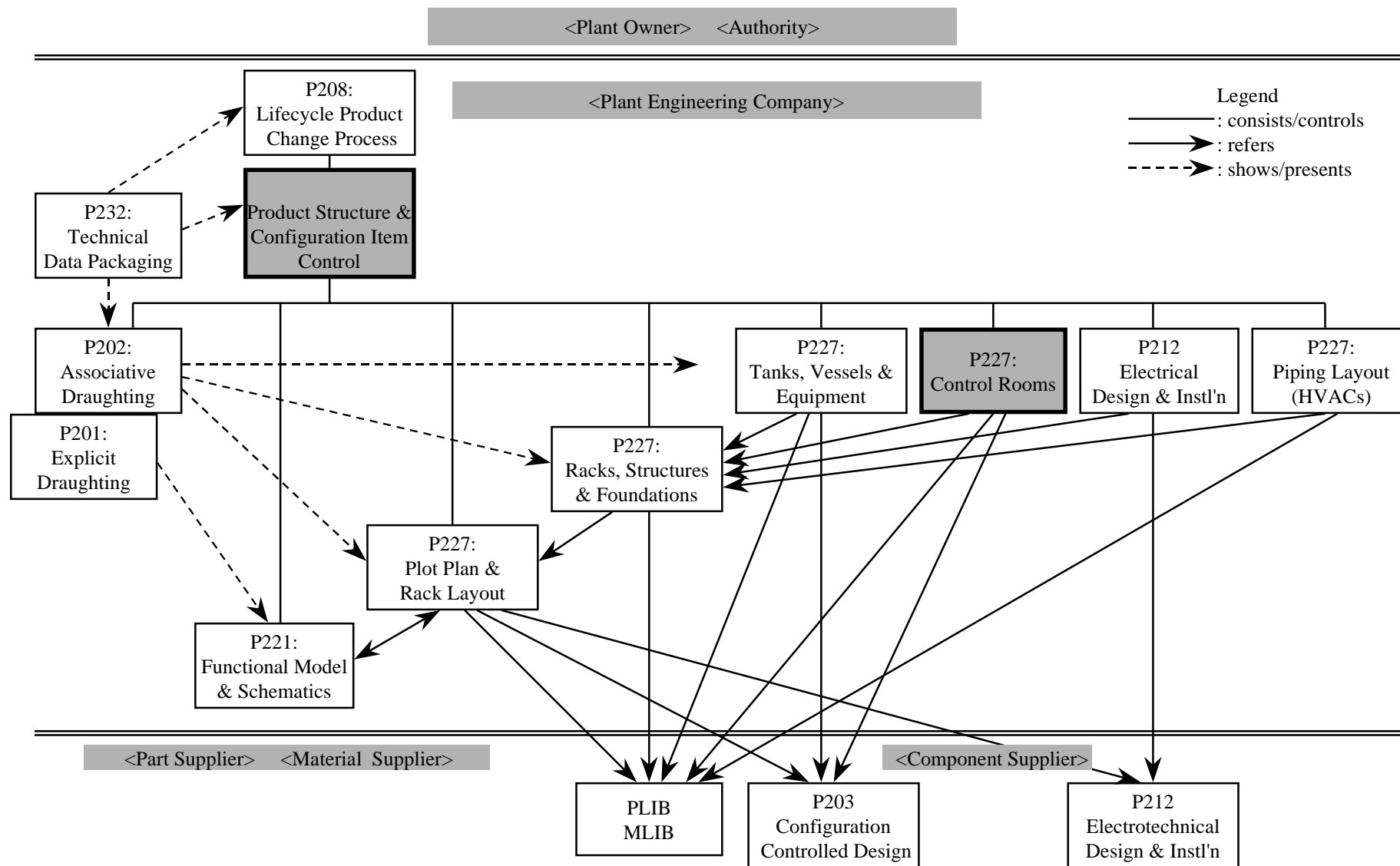
Fig-11.5 Dependencies of APs for Ships

Fig-11.7 Dependencies of APs for Process Plants

12 Recommendation-7 :
Check List for PWI/NWI Proposal of AP/AIC Development

When PWI/NWI is proposed, those proposals are to be analyzed and reviewed by PNWI team, using the following . Check List for PWI/NWI Proposal of AP/AIC Development.

12.1 Analysis of . Scope Definition.

Analyze the . Scope Definition. of PWI/NWI for identifying the Positioning of the Proposed AP PWI/NWI,
(1) on the Business Function and/or Discipline (Table-2.3, Table-7)
(2) on the AP Classification Structure (Fig-5.1, Fig-7)

12.2 Analysis of . Architecture. and/or . Approach. of PWI/NWI

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12.3 Defining the Position of the PWI/NWI

12.3.1 Check the Position of the PWI/NWI using the Criteria, defined in Chapter 6
(1) out Scope of SC4
(2) out Scope of STEP but in Scope of SC4
(3) in Scope of STEP

12.3.2 Define the Approach for the proposed PWI/NWI
Define the Approach for the proposed PWI/NWI, out of following options;
(1) in case of strict . in Scope of STEP. , accept the proposal as a NWI;
  A Develop a new set of APs, simultaneously develop the new set of AIRs and AICs
  B Develop a new set of APs, simultaneously develop the new set of AICs
  C Develop a new set of APs, using existing AIRs and AICs
  D Version up the existing AP, simultaneously version up the existing AIRs and AICs

(2) in case of . out Scope of STEP but in Scope of SC4. , . in Scope of 10303 STEP. but need to be
      some change, differ the proposal to accept as a PWI/NWI, and request or recommend;
  A Change the Scope Definition
  B Change the Approach
  C Harmonize with existing Projects, they have the overlapping scope

(3) in case of . out Scope of SC4. , reject the proposal to accept as a STEP/SC4 NWI.

Annex A

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Annex B

Acronyms

AAM : Application Activity Model
AIC : Application Interpreted Construct
AIR : Application Integrated Resource
AP   : Application Protocol
ARM : Application Reference Model
CC   : Conformance Class
GIR : Generic Integrated Resource
NWI : New Work Item
PNWI : Preliminary New Work Item
STEP : Standard for the Exchange of Product data model
UoF : Unit of Functionality

Annex C
Understanding and Facing to
the . Origin of Difficulties.
(Preliminary)

C.1 Ambitious Challenge for the . Product Modeling.

(1)   . Product Modeling. is an Evolutional Technology

C.2 Versatile Industry

(1) Business Relationship Difference
    Customer and Supplier : Position on Customer-Supplier Chain
    Core Business : Concentration for Core Competence Business and Virtual
            Corporation with Partners

(2) Business Process Difference
    Indent Process and Mass/reproducing Process

C.3 Versatile Business Function and/or Discipline

C.4 Cooperative Work between . Real Industry World. and
. Information Technology World. ;
i.e. . Product Design Engineers, Production Engineers.
and . Information Systems Engineers.

(1) Terminology Barrier, Terminology Difference
    Each Discipline has its own terminology,
     but may using different terminology in different Industry
    Same word carrying deferent meaning, based on different concept
    Same thing in different word

C.5 IT : Information Technology is an Evolutional Technology

C.6 New Comers

(1)   Proposing New Ideas, New Technologies

(2) Raising New Issues, New Viewpoints

(3) Misunderstandings